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Decoding Nonverbal Expressions of Emotion of Men and Women

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Abstract

In this experiment participants viewed 42 images of 7 different facial expressions and asked to identify the emotion associated with the expression. Participants were separated into a control group and an experimental group. Participants in the control group were shown 21 male and 21 female expressions of the following: Anger, Sadness, Happiness, Fear, Disgust, Surprise, and a Neutral expression; each presented 3 times. The experimental group was given the same procedure with the addition of phrases that accompanied the images that were either: congruent, incongruent, or unrelated to the expression. Accurately decoding the expression was measured and factors of significance in the ability to accurately decode facial expressions of emotion observed were: participant gender, picture gender, and statement congruency. The results of this study suggest that both genders more accurately decode female emotions than male emotions. The interaction of statement congruency and picture gender suggests that unrelated statements presented with male pictures decreased accuracy while unrelated statements presented with female pictures increased decoder accuracy. Congruent and incongruent statements did not affect decoder accuracy. Participant gender differences were not significant in the ability to decode facial expressions of emotions.

Keywords: Facial expressions, Emotions, Nonverbal Expressions

Introduction

Facial expressions have long been thought of to possess the quality of being universally understood, that is to say that most individuals are able to identify the emotional context being expressed in a facial expression. The origins of this concept can be dated as far back as Aristotle pose the idea of Universal Facial Expressions; "Everyone knows that grief involves a gloomy and joy a cheerful countenance.... There are characteristic facial expressions which are observed to accompany anger, fear, erotic excitement, and all the other passions" (Aristotle, nd/1913, pp.805, 808). Many great minds throughout history came to find that they shared the same idea as Aristotle, and posed their ideas upon the subject. In 1806 Bell published a work in which he wrote that the expressions of man and animals are so easily expressed and interpreted the reason for this was that it was natures design (Bell, 1806). Again this idea was expanded upon by another man Boulogne in 1862 who claimed that because facial expressions utilized muscles every human possessed, that it was the intention of the creator of man that expressions be universal (Boulogne, 1862). Clearly the idea of Universal Facial expressions had a long established history; however the man most credited with its creation was Darwin. In 1872 Darwin released *The expressions of emotion in man and animals*, in this work Darwin suggested an evolutionary reason to explain the universality of facial expressions. Darwin's work heavily influenced the scientific field and is most commonly drawn on to cite the history and creation of the theory of universal facial expressions (Darwin, 1872). Darwin's work the scientific community encouraged research of facial expressions to answer the question of whether facial expressions were truly universal.

A substantial amount of research has been carried out in an effort to answer a single question. The question being whether facial expressions are innate qualities every person is born with; or that facial expressions are learned behavior and inconsistent from one culture to the other. As research progressed, evidence accumulated that suggested facial expressions did in fact possess the quality of universality, and presented a strong support for the evolutionary standpoint. From the immense amount of studies performed, twelve research studies can be identified as providing some of the most critical support for this reasoning.

In a 1994 meta-analysis review, Russell presented his review of eleven of the twelve experiments that provided the most important evidence to support the universal recognition of emotions from facial expressions. Russell presents his argument that forced choice questionnaires used in previous studies present skewed results (Russell, 1994). Although Russell's article was later rebutted by Ekman (Ekman, 1994) and Izard (Izard, 1994), to be created on the basis of flawed reasoning; the article cannot be dismissed as it clearly and consciously presents the data from the most

important studies regarding the universality of facial expressions. Absent from Russell's critique is Ekman's 1972 study for which many in the field claim as one of the most important psychological studies performed in the last 50 years. In Ekman's study he presented images of expressions to culturally diverse groups; 5 literate countries, and 2 preliterate countries. The results of the study strongly supported the existence of universal expressions (Ekman, 1972). From Russell's article 11 studies are presented, the first of which is again from Ekman (Ekman, 1980) whose conclusion stated that there was evidence for the "existence of facial expressions of emotion which are considered universal" (p.210). Russell cites: Izard (1980), Frijda (1986), Fridlund, Ekman and Oster (1987), Gudykunst, Ting-Toomey (1988), and Buck (1988) as all stating that the data collected from their studies indicated that certain facial expressions were universally recognized regardless of culture. Izard and Saxton (1988), Oster, Daily and Goldenthal (1989), Mesquita and Frijda (1992), Carlson and Hatfeild (1992); Russell cites all these researchers as repeatedly coming to the conclusion that universal facial expressions are a true phenomena. In the article Russell selects a quote taken from Brown's 1991 study "The conclusion seems inescapable. There are universal emotional expressions" (p.26). As each of the eleven studies came to the conclusion that universal recognition of facial expressions exists, it concisely shows that years of research has consistently come to the conclusion that universal facial expressions exist (Russell, 1994).

With the scientific community mostly satisfied with the conclusion that universality of facial expressions existed, researchers continued to further study the phenomena. Researchers then attempted to identify differences in the ability to decode facial expressions; a common variable tested against accuracy was gender. When researchers began to collect data on sex differences in the ability to decode facial expressions a contradictory trend began to emerge, the data one study published, simply did not agree with other researcher' results.

One of the first studies to publish gender differences was done by Zuckerman, Lipets, Koivumaki, and Rosenthal (1975). Their study looked at the ability to encode and decode nonverbal cues of emotion. The study was divided into two separate procedures one for encoding, and one for decoding. In the encoding procedure subjects were given an emotion to portray by visually sending it to participants. In the decoding procedure study participants were given the six universal emotions, which they viewed on a projector which had 120 slides. The data they collected suggested that the ability to encode and decode emotional cues did not share any relationship. Their data also suggested that females were only slightly better encoders, but significantly better decoders than their male counterparts (Zuckerman, Lipets, Koivumaki, & Rosenthal, 1975).

Another study performed by Carton, Kessler, and Pape recorded results that conflicted with those found in Zuckerman's et al., 1975 study. In their study the researcher's goal was to determine if a relationship between well-being and the accuracy in decoding emotional expressions existed. In the study researchers had college level students look at photographs of female and male adults performing varying intensities of fearful, sad, happy, and angry expressions. The participants were then given a series of well-being scales, such as the Ryff Psychological Well-Being Scale, and the CES-Depression Scale. The results from the study demonstrated that participants who were significantly worse at decoding facial expressions showed less relationship well-being as well as higher scores on the depression scale. The researchers also report that gender differences in decoding facial expressions were not significant (Carton, Kesslerm Pape, 1999).

A more recent study looked at the phenomenon that female subjects in previous studies had difficulty decoding male anger. The researchers had participants view photographs of persons showing the seven universal emotions, excluding the expression of neutral. The participants were then asked to describe the expression choosing the label provided by the experimenter. The results yielded some interesting data, males were found to mistakenly assign labels of anger and disgust inaccurately at a significantly higher rate than other labels. While female subjects were found to mistakenly assign labels of fear and sadness at a higher rate than other labels. The researchers found that male anger was decoded at the same rate of

accuracy by both sexes, and that female anger was more accurately decoded by female subjects. The study also found that females were significantly better decoders overall, with a higher accuracy at determining facial expressions (Goos & Silverman, 2002). Again results conflicted with the previous study performed by Carton et.al in 1999, and supported the results found by Zuckerman et. al., in their 1975 study.

Another research experiment performed by Larkin, Martin, and McClain tested 101 adult participants to see if there was a possible relationship between hostility and the ability to accurately decode facial expressions existed. The researchers used photographs of facial expressions and asked participants to answer a questionnaire in which they were given seven choices. The seven universal emotions excluding the expression of neutrality, along with the option to state that the emotion expressed was neutral. The researchers measured hostility using the Cook-Medly Hostility Scale, the results yielded significant data. The data suggested that a higher rating on the Hostility Scale led to more inaccurate results. The researcher's explanation for this was that with a hostile predisposition subjects were more likely to mistake emotional expressions of disgust for anger, and happiness for neutrality. The researchers also looked at the gender differences in the ability to decode facial expressions as previous data had suggested that males would overall make more errors in decoding facial expressions. In this study however, the data suggested that males would make more errors in decoding the expression of disgust and were similar in number of errors with female subjects for all other facial expressions (Larkin, Martin, & McClain, 2002). This study again conflicted previous research, by publishing results that suggested only minor gender differences; related to one specific expression.

In an intensive study by Floyd and Mikkelson, the researchers looked at how hemispheric dominance and gender affected the subject's ability to decode facial expressions. The participants were asked to view the first part of the Facial Meaning Sensitivity Test, which consisted of ten photographs each depicting a young woman's facial expression. In this study there were ten facial expressions, considered basic and complex. The results of the data concluded that female participants who had mixed hemispheric dominance were significantly better decoders than female participants with left or right hemispheric dominance. However, the opposite was true for men, the data collected suggested that men who had mixed hemispheric dominance were actually significantly worse decoders than men who were left or right hemispheric in dominance. The effect of gender was significant but was un-interpretable. Lastly, the researchers found a significant correlation between age and the ability to decode emotions more accurately, the explanation given for this was that older participants were more exposed to facial expressions and because of this had a greater familiarity with them (Floyd & Mikkelson, 2003). Here the researchers were unable to interpret the results of gender on the ability to decode facial expressions accurately but present evidence that both gender's ability to decode facial expressions depended on their hemispheric dominance. This study cannot objectively be used to state a gender difference in the ability to decode facial expressions but, it does show evidence that the ability to accurately decode expressions is related to individual differences which may be more important than sex differences in decoding facial expressions.

In a 2004 study performed from researchers Plant, Kling, and Smith, the researchers found no gender differences in the ability to decode facial expressions. In the study participants were asked to view photographs of facial expressions of blended expressions of anger and sadness. Then asked to rate the intensity of these emotions. Their study found that male and female subjects were similar in their ability to decode facial expressions. The results of their research found that both genders male and female significantly rated female expressions more inaccurately as portraying sadness (Plant, Kling, & Smith, 2004). As with previous studies the results of this study suggest that no gender differences exist in the ability to decode facial expressions, but gender differences do exist in the ability to encode facial expressions.

The claim of gender differences in the ability to decode facial expressions has been clearly demonstrated, the result of which is two different conclusions. One conclusion that there is no gender

difference in the ability to decode facial expressions supported by studies from researchers like Carton et.al (1999), Larkin et.al (2002), and Plant (2004); another conclusion is that there is a gender difference in the ability to decode facial expressions and that female decoders demonstrate a greater accuracy in doing so, and this is supported by studies from researchers such as Zuckerman et.al (1975), and Goos et.al (2002). From these conflicting results it was determined that more research must be undertaken to determine if any observable gender differences existed in the ability to accurately decode facial expressions. If gender differences existed then both groups would show a trend towards one sex having a greater ability to accurately decode facial expressions. Through the use of incongruent, congruent, and unrelated textual cues researchers sought to determine which gender would be more influenced by the cues? The reasoning behind this is that the gender who would have more difficulty correctly identifying the expression shown, would rely more on the textual cues and less on the facial expression suggesting a weaker ability to decode facial expressions. Therefore, our first hypothesis was that gender differences would be observed in the ability to accurately decode facial expressions of emotions. The second hypothesis was that male participants would be more accurate at identifying male expressions compared to female expressions. The third hypothesis was that female participants would be more accurate at identifying female expressions compared to identifying male expressions. The fourth hypothesis was that expressions such as fear and anger would be most accurately decoded. The fifth and final hypothesis was that expressions presented with incongruent, and unrelated textual cues would result in a decreased ability to decode facial expressions and correspond to a specific gender.

Method

Participants

Participants for this study were Stetson University students enrolled in various psychology courses. Twenty-six students participated in the study, 13 male students and 13 female students whose ages ranged from 18 to 25. Participants were recruited through flyers, and were required to participate in a minimum of 3 studies as part of course requirements. Participants were also compensated with drinks and snacks for partaking in the experiment. Participants were told the only requirements for the study were the ability to read, write, and see clearly at a moderate distance.

Materials and Procedure

A questionnaire form was used. The questionnaire asked participants to mark bubbles that correlated to the experimental exercise. After participants completed the form, a short survey was administered which asked the participant to record their: age, gender, and report any disability which may have interfered with their ability to properly perform the experiment. Images for the experiment were selected from the Pictures of Facial Affect (PoFA; Ekman & Friesen,. 1976) a validated and coded data set of human facial expressions. Forty-two images were selected, 21 male and 21 female images. Each of the 7 facial expressions being tested appeared 3 times for both male and female images. Therefore 6 images of happiness, sadness, surprise, fear, disgust, anger, and neutrality were shown each being equally represented by both male and female images. A slide presentation was created to present the images to the participants. The first 21 images shown were male followed by the 21 female images with the emotional expressions being presented in random order. Images for the experimental group were accompanied by an additional textual cue that was not present in the control groups design. The textual cues fell into 3 categories: cues that were congruent to the expression, incongruent to the expression, or unrelated to the expression being shown. An example of how these cues were presented is as follows:

> A participant views an image of a man smiling.
>
> *Congruent Cue*: Tom is a happy man.
>
> *Incongruent Cue*: Tom is deeply depressed.
>
> *Unrelated Cue*: Tom owns a computer.

In both groups participants were given a 42 question answer form which provided the participants with the areas to mark what emotion they believed they were being shown. Participants were to mark

what emotion they observed to the question number it correlated to. Each participant was given 8 seconds to observe the expression, determine the emotion being expressed, and record it on the answer form in the appropriate location. The experimenter performing the procedure read the following statement to each group: "Directions: The participant will be shown images of persons varying in gender, age, race, and emotional expression. Participants are asked to record to the best of their ability, what emotional expression is being observed and record their answer in locate below. An example is provided below in the bordered box. Are there any questions on how to perform this task?" Once the slide presentation was completed a short survey was also completed by participants which asked for gender, age, and reasons for participant exclusion. Participants completed the task in groups and once complete participants were offered Vitamin Water and a variety of potato chips

Design

This study used a 2 x 2 x 3 x 7 mixed group within-subject design. The independent variables were the image gender, congruency of the textual cues, and type of emotion shown. The dependent variable was the accuracy of participant in correctly identifying the emotional expression being shown.

Results

Analyses in this study focused on the ability of participants to correctly identify the emotion expression. The mean accuracy for male participants correctly identifying facial expressions was 8.244 (*SD* = 0.169), while the mean accuracy for female participants correctly identifying facial expressions was 8.256 (*SD* = 0.169). An analysis of variance (ANOVA) for a repeated measure design was used to determine the effect of gender. No significant results were found, $F(1, 24) = 0.003$, $p > .05$.

A MANOVA was used to compare the mean number of correct emotion detections by participant gender, picture gender, and statement-picture congruency. The analysis revealed significant results for the following: an interaction between picture gender and congruency and a main effect of picture gender. The mean score for congruent statements presented with male picture genders was 7.808 (*SD* = .170), and for female picture genders the mean score was 8.462 (*SD* = .257). The mean score for incongruent statements presented with male picture genders was 7.885 (*SD* = .159), and for female picture genders the mean score was 8.50 (*SD* = .255). The mean score for unrelated statements presented with male picture genders was 7.538 (*SD* = .192), and for female picture genders the mean score was 9.308 (*SD* = .186). The interaction between picture gender and congruency was significant; $F(2, 23) = 6.873$, $p < .001$. The mean accuracy of both participant genders for male picture gender was 7.744 (*SD* = .106) and for female picture gender the mean accuracy was 8.756 (*SD* = .194). The main effect of picture gender was significant, $F(1, 24) = 26.613$, $p = .001$. An alpha level of .05 was used for all analyses (See table 1. for the interaction between picture gender and congruency, and the main effect of picture gender data).

A second MANOVA was used to investigate possible relationship between the emotional expression and picture gender. The analysis revealed significant results for the following: an interaction between type of emotion shown and picture gender, and a main effect of type of emotion shown. The mean score of accuracy error for happiness expressed by male images was 3.00 (*SD* = .00), while the mean score of error for happiness expressed by female images was 3.115 (*SD* = .083). The mean score of error for sadness expressed by male images was 2.285 (*SD* = .124) and the mean score of error of the same emotion expressed by female images was 4.231 (*SD* = .226). The mean score of error of surprise expressed by male images was 3.077 (*SD* = .052) and the mean score of error for the emotion of surprise expressed by female images was 3.154 (*SD* = .072). The mean score of error of the emotion fear expressed by male images was 3.692 (*SD* = .146), and the mean score of error for female images was 3.731 (*SD* = .191). The mean score of error of the emotion disgust expressed by male images was 3.692 (*SD* = .106), and the mean score of error of the same emotion expressed by female images was 4.346 (*SD* = .212). The mean score of error of the emotion anger expressed by male images was 3.269 (*SD* = .106), and for female images the mean score was 4.231 (*SD* = .127). The mean score of accuracy error for the emotion neutrality expressed by male images was 3.115 (*SD* = .065), and for the same emotion expressed by female images the mean score was

3.462 (*SD* = .126). The interaction between type of emotion shown and picture gender was significant, F (6, 19) = 6.873, p = .001. The mean accuracy error for the emotion of happiness was 3.058 (*SD* = .042), of sadness was 3.808 (*SD* = .142), surprise was 3.115 (*SD* = .043), fear was 3.712 (*SD* = .114), disgust was 4.019 (*SD* = .150), anger was 3.750 (*SD* =.079), and the mean accuracy error score of neutrality was 3.288 (*SD* = .069). The main effect of type of emotion shown was significant, F (6, 19) = 30.351, p <.001 (See table 2. for the interaction of emotion shown and picture gender, and the main effect of type of emotion shown data, See figure 2. for the main effect of type of emotion shown).

Discussion

The data collected does not support the first hypothesis that gender differences would be observed in the ability to accurately decode facial expressions of emotion. The results of the statistical analysis did not find any significant interactions between the participant gender and the ability to accurately decode facial expressions. Male and female participants were found to decode facial expressions at similar rates, which does not support the first hypothesis presented. These results however do coincide with previous research results that found no gender differences in the ability to decode facial expressions like Carton et.al (1999), Larkin et.al (2002), and Plant (2004). The results of this study suggest that no gender differences exist, and therefore previous studies who reported gender differences may be inaccurate in the procedure of analysis of data.

The second hypothesis that male participants would be more accurate at identifying male expressions was also not supported. The data collected actually suggests that male participants are more accurate at identifying female expressions more accurately. The third hypothesis that female participants would be more accurate at identifying female expressions was supported, but a caveat exists in reporting these results. Both male and female participants were more accurate at decoding female expressions when compared to male expressions (See figure 1. For picture gender decoder accuracy).This data suggests that female expressions may be more easily decoded; or more accurately encoded. Turning to previous studies like Zuckerman et.al (1975) who published results suggesting females were better encoders of emotion, the results from this study suggest this conclusion may be viable.

The fourth hypothesis that expressions of fear and anger would be most accurately decoded was not supported. The data from this study suggests that the most accurately decoded facial expressions were that of: happiness, surprise, and neutral expressions (See figure 2. for data on type of emotion shown decoder accuracy). This is interesting because Darwin's (1872) proposal of the universality of emotions was based around evolutionary theory, and suggested that the universality of expressions were a result of a need to identify the intentions of another party. So if one person would view another person's face and be able to determine if harm was the intention (anger) or if the person was friendly (happiness) by their expression. The hypothesis of fear and anger being the most accurately decoded expressions resulted from the idea that survival would be increased if one was more able to avoid harmful parties. The results of this study found that fear, anger, sadness, and disgust were the most inaccurately identified emotions. An explanation proposed by this study for these results are that the most inaccurately identified emotions were viewed as interchangeable by participants. Anger, fear, disgust, sadness are all very vivid emotions that signal danger, and are similar in their visual display. Happiness, surprise, and neutral expressions are all unique expressions that are difficult to confuse.

The fifth and final hypothesis was that expressions presented with incongruent, and unrelated textual cues would result in a decreased ability to decode facial expressions and correspond to a specific gender, was not supported. As previously stated no gender differences were observed for decoding facial expressions, the textual cues did not have a significant interaction. A significant finding was recorded however, the interaction of statement congruency and picture gender. The data from this study suggests that unrelated statements presented with male pictures decreased decoder accuracy while unrelated statements presented with female pictures increased decoder accuracy. Congruent and incongruent statements did not affect decoder accuracy (See figure 3. For data on congruency and

picture gender interaction). Previous studies do not report findings that would explain the occurrence of this trend. A plausible explanation may be that female expressions were encoded better than male expressions and the unrelated statements did not affect participant decision making; the male expressions were encode worse than the female expressions and the unrelated statements may have confused participants cause them to wrongly assign incorrect labels of emotions.

A result not predicted by researchers was the effect of picture gender, as previously stated picture gender recorded significant results for female expressions being more accurately decoded by both genders. Another significant finding reported was the interaction of picture gender and type of emotion shown on decoder accuracy. The data shown suggests that female expressions were more accurately decoded and the type of emotions most accurately decoded were those of happiness, surprise, and neutral (See figure 4. for picture gender and emotion expression interaction data). Male subjects were also most accurate at decoding female expressions of happiness, surprise, and neutral expressions; however the results were not significant. Female subjects were most accurate at decoding female expressions of happiness, surprise, and neutral female expressions; however the results were not significant.

The results of this study suggest that encoder gender is more important than decoder gender for accurately identifying the emotional expression. This may be where previous studies misinterpreted results that suggested a single gender possessed a superior ability to decode facial expressions. The major findings of this study were that female expressions were most accurately decoded, that expressions of happiness, surprise, and neutrality were more accurately decoded, and that unrelated textual cues increased decoder accuracy in female expressions, and decreased decoder accuracy in male expressions. The findings of this study are important because they support previous studies which cited no gender differences existed. In previous studies where gender differences were found may have been a result of misinterpreting gender differences in the ability to encode facial expressions. This study suggests that encoder gender and type of emotion expressed are more powerful factors in correctly identifying the emotional expression, than previous studies have expressed and that more research is needed to determine the effect of such factors. Although the findings of this study do not support researchers Zuckerman et.al (1975), and Goos et.al (2002), the data does support researchers like Carton et.al (1999), Larkin et.al (2002), and Plant (2004) that proposed accurately identifying emotional expressions is not gender significant.

Implications & Limitations

Implications for the theory of universal facial expressions resulting from the data from this study are selective. Females may be better encoders of expressions; this particular study did not focus around this idea but supports this concept as a feasible concept that supports our results. Statement congruency affecting decoder accuracy differently for each gender was an unexpected result and may imply that the process that men and women use to decode facial expressions may not be cognitively similar. If the two processes are not similar than a greater understanding of how each process works is critical to better understand how people perceive facial expressions.

Implications from this study for consumer areas such as advertisement can be inferred. In the consumer sector understanding how facial expressions are perceived plays an important role in portraying a product to the audience. Advertisements utilizing female facial expressions which this study suggests are more accurately perceived, may provide the audience a greater ability to understand the message of the advertisement.

In the mental health sector understanding how facial expressions are perceived is important in all areas ranging from the hearing impaired to patients with severe schizophrenia. A major facet of nonverbal communication research is on the disorder Autism; researchers hope a greater understanding of facial expressions will allow children with Autism to better communicate and increase the effectiveness of Autism Therapies.

The implications of this study are limited by 4 major factors; population selected, sample size, fatigue, and reason for participating. As the study consisted of

Stetson University College students the data is specific to populations of the same make up, and therefore lacks a strong ability to be generalized to other populations. The second major limitation was the sample size of 26 participants; a greater number of participants may have yielded different results. The third major limitation of this study was fatigue; the participants were asked to record responses to 42 images and may have recorded results incorrectly due to boredom or lack of interest. Finally the participants were required to participate in several experiments are part of a course requirement. Many participants did not want to participate and could have reported data incorrectly because of the forced participation. In order to combat this in our study, participants were offered chips and drinks as an incentive and although no data seemed corrupt; it still is a possibility.

Improvements

This study could be improved by increasing the number of participants and having willing (un-forced) participants. Greater generalization of the results would be improved by having participants who vary in age, socio-economic status, race, and education.

Future Research

Future research which should be done in this field of study should look at the cognitive processes of decoding facial expressions and the biological aspects of face recognition. Researchers such as Floyd & Mikkelson (2004) have already began to find data that suggest that biological psychology attributes like hemispheric dominance plays an important role in the ability to accurately decode facial expressions. Research should now begin the take similar biological approaches to determine how encoding facial expressions occurs, as well as perform more studies on how cognitive processes occur in respect to both encoding and decoding facial expressions. Future research should also look to past studies and see if confounding variables could have caused the discrepancy in conclusions regarding gender differences in decoding expressions.

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Table 1

Summary of Multivariate Tests of Picture Gender, and Statement Congruency on the ability to accurately decode Facial Expressions of Emotion.

Variable	n	F	p	$F(v_1,v_2)$
Congruency by Picture Gender	26	6.873	p =.001	(1, 24)
Picture Gender	26	10.378	p <.001	(2, 23)

Note. $F(v_1,v_2)$ refers to F with v_1 and v_2 degrees of freedom.

Table 2

Summary of Multivariate Tests of emotional expression and picture gender.

Variable	n	F	p	$F(v_1,v_2)$
Emotion shown & Picture Gender	13	6.873	p = .001	(6, 19)
Emotional Expression	13	30.351	p <.001	(6, 19)

Note. $F(v_1,v_2)$ refers to F with v_1 and v_2 degrees of freedom.

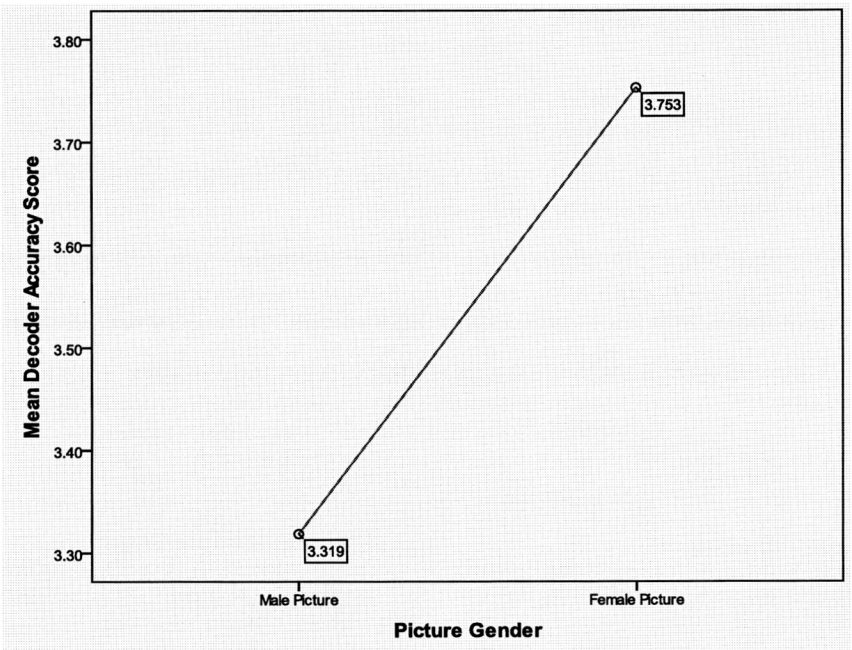

Figure 1. Mean decoder accuracy in emotional expression recognition of picture gender categories: male and female picture genders. Decoder accuracy differences were found in the picture gender shown. Female expressions were decoded more accurately, than male expressions.

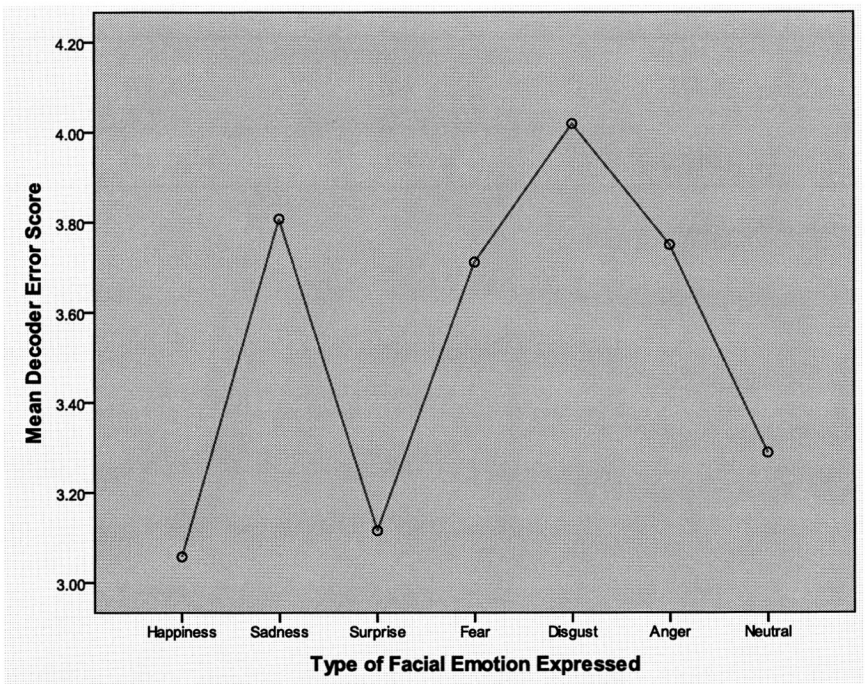

Figure 2. Mean decoder error values representing decoder error in identifying the emotional expression observed during testing. Decoder accuracy was most inaccurate in identifying the emotions of Sadness, Disgust, Fear, and Anger. Decoder accuracy was most accurate in identifying emotions of Happiness, Surprise, and Neutrality.

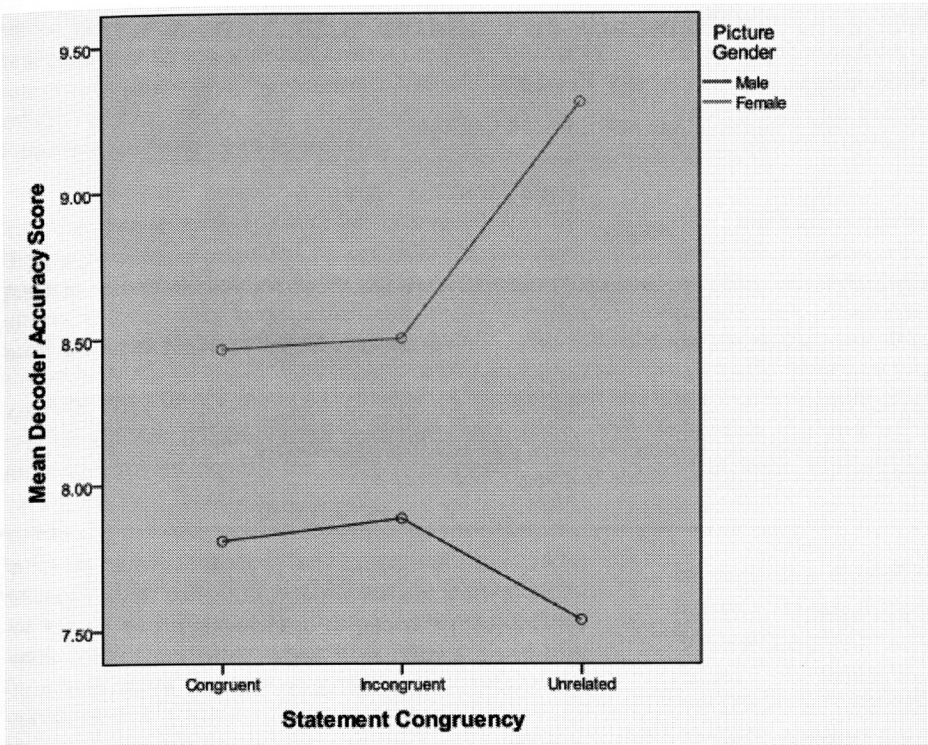

Figure 3. Mean Decoder Accuracy of emotional expressions presented with congruent, incongruent, and unrelated statements. No decoder accuracy differences were found in the congruent and incongruent statements. Decoder accuracy was increased by unrelated statements presented with female expressions, and decoder accuracy was decreased by unrelated statements presented with male expressions.

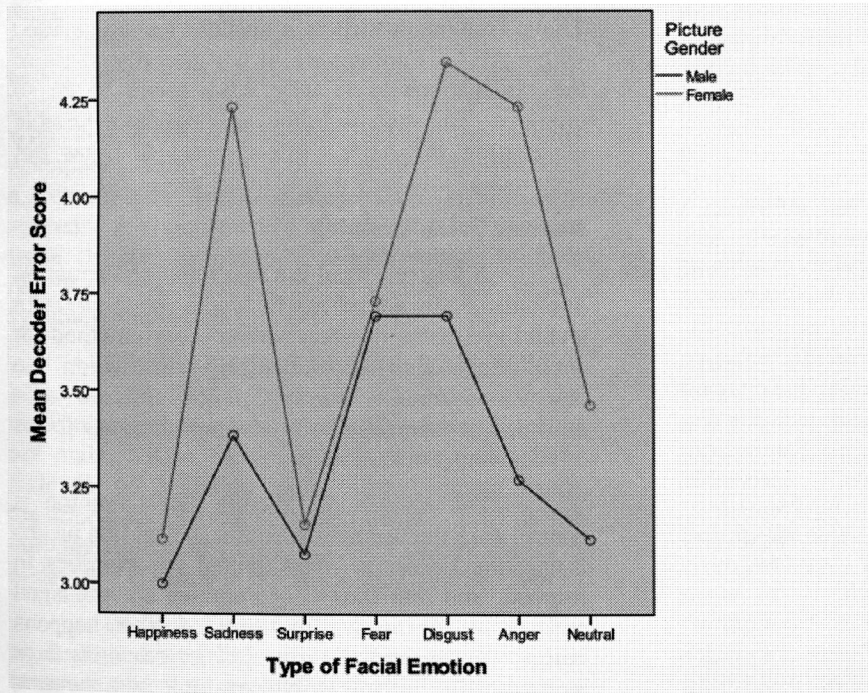

Figure 4. Mean Decoder Error Score representing the occurrence of decoder error in identifying the emotional expression observed by Picture Gender Observed. Misidentifying female emotions of Sadness, Disgust, and Anger were the most commonly made mistake. Decoder accuracy was most accurate in identifying expressions of emotions of Happiness, Surprise, and Neutrality.